CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ORDER NO. 91-025

SITE CLEANUP REQUIREMENTS FOR:

TELEDYNE SEMICONDUCTOR, INC.
1300 TERRA BELLA AVENUE
MOUNTAIN VIEW
SANTA CLARA COUNTY

SPECTRA-PHYSICS LASERS, INC.
1250 WEST MIDDLEFIELD ROAD
MOUNTAIN VIEW
SANTA CLARA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region (hereinafter called the Board) finds that:

1. Site Location and Description This Order presents the selected final remedy for the Spectra-Physics proposed Superfund site and the Teledyne Superfund site. Since approximately 1963, Spectra-Physics Lasers, Inc. (Spectra-Physics) has manufactured lasers and associated components at its Mountain View facility (Figure 1). The facility consists of nine buildings in the Terra Bella Avenue/West Middlefield Road area. Seven of the nine buildings are bounded by West Middlefield Road, Terra Bella Avenue, and North Shoreline Boulevard (formerly Stierlin Road). The other two buildings are on the northwest side of Terra Bella Avenue. Since 1962, Teledyne Semiconductor, Inc. (Teledyne) has owned and operated a semiconductor manufacturing facility at 1300 Terra Bella Avenue, (Figure 1). The surrounding terrain gently slopes northward towards San Francisco Bay, which lies approximately 3 miles north of the Site. Permanente Creek lies approximately 0.3 miles west of the facilities and flows to the north.

2. Description of the Selected Remedy The selected remedy for the sites consists of:

   - Soil vapor extraction and treatment for soil cleanup
   - Groundwater extraction and treatment for groundwater cleanup
   - Shallow zone, intermediate zone and deeper aquifer groundwater monitoring and soil monitoring. Soil monitoring includes collection soil samples and soil vapor monitoring at Spectra-Physics.

   There are currently three soil vapor extraction wells and nineteen groundwater extraction wells operating at the sites. The final remedy will include the installation of an expanded soil vapor extraction system at Spectra-Physics and commencement of operation of 5 existing groundwater extractions wells. Vapor phase carbon adsorption will be used for the soil vapor treatment and air stripping or discharge to the sanitary sewer will be used for groundwater treatment.

3. NPL and Regional Board Orders The Teledyne Semiconductor site is on the National Priorities List (NPL) and Spectra-Physics site is proposed for listing on the NPL. The sites have been regulated by the Regional Board Orders listed below:

Teledyne

- o February 1986 - Order No. 86-9, Waste Discharge Requirements
- o June 1986 - Teledyne Semiconductor site is added to the NPL
- o September 1986 - Cleanup and Abatement Order No. 86-011
- o January 1987 - Cleanup and Abatement Order No. 87-002
- o January 1989 - Order No. 89-019, Site Cleanup Requirements

Spectra-Physics

- o February 1986 - Order No. 86-10, Waste Discharge Requirements
- o September 1986 - Cleanup and Abatement Order No. 86-012
- o January 1987 - Cleanup and Abatement Order No. 87-003
- o June 1988 - Spectra-Physics site proposed for listing on the NPL
- o January 1989 - Order No. 89-020, Site Cleanup Requirements

4. Site History

4.1 Teledyne Two 1400 gallon below-grade sumps were installed at the site in 1962 and 1966, respectively. Prior to 1980, the sumps were used for acid neutralization and waste trichloroethylene (TCE) collection. Neither sump has contained TCE since 1980 and the two sumps are no longer in service. New industrial wastewater lines are now piped through the sumps and connect to the City of Mountain View sewer line. A 2,000 gallon underground waste flammable solvent tank (Tank A) was installed in 1975 and removed in 1982. It was used to store waste isopropyl alcohol, xylene and acetone. Teledyne also used 1,1,1-trichloroethane (TCA) and other volatile organic compounds (VOCs) at the facility. All underground solvent handling activities were discontinued in 1980 and all chemicals are currently stored above-ground.

4.2 Spectra-Physics One 50 gallon and four 1000 gallon underground sumps were installed between 1968 and 1977. Rinsewaters were discharged through these sumps to the sanitary sewer for the primary purpose of pH and flow equalization. All but one of the sumps were removed in 1987. The remaining sump is primarily used for settlement of solids. Spectra-Physics has used TCE, TCA, Freon-113 and other VOCs in its manufacturing processes.

4.3 Background In 1982, Teledyne and Spectra-Physics submitted Facility Questionnaires to Regional Board staff describing their underground neutralization systems, sumps, and tanks. Based on these submittals, staff required the initiation of the remedial investigation (RI) at Teledyne in 1982 and Spectra-Physics in 1984. The RI has been ongoing for the last eight years. Interim remedial actions began at Teledyne in 1986 with the start up of a groundwater extraction system. The feasibility study (FS) evaluates the interim remedial actions that have been ongoing for the last four years and evaluates alternatives for the final remedy. Teledyne and Spectra-Physics have submitted Remedial Investigation / Feasibility Study (RI/FS) reports for the on-site and off-site areas. The on-site area for each company is the area within the respective property boundaries. The off-site areas are generally referred to as the Spring Street and North Bayshore off-site areas. The off-site areas encompass the full extent of the off-site groundwater plume and are generally bounded by Permanente Creek to the west, the City of Mountain View dewatering trench to the north, Armand Avenue to the east, and the on-site areas to the south. The RI/FS reports summarize the last eight years of the RI and the last four years of the interim remedial actions.

4.4 City of Mountain View Landfill The City of Mountain View 150-acre landfill parcel is located directly north of Amphitheatre Parkway between Permanente Creek and N. Shoreline

Blvd. The City of Mountain View (City) has submitted a Solid Waste Assessment Test (SWAT) for its landfill dated November 21, 1988. Subsequently, the City has submitted additional quarterly and other supplemental monitoring data. Board staff accepted the SWAT on February 23, 1990 and has not required a corrective action plan for the landfill. VOCs at low concentrations have been detected in groundwater monitoring wells around the landfill. The City has submitted the "City of Mountain View Landfill VOC Status Report" dated September 1989 which states that these VOCs do not appear to be correlated with landfill leachate and may originate from off-site sources. When the City landfill dewatering trench pump is operating, the pump discharges into Permanente Creek. This discharge from the dewatering trench pump contains VOCs from the Teledyne and Spectra-Physics groundwater plume. This discharge should cease when the North Bayshore extraction system is fully implemented. This discharge may recharge groundwater in the area of Permanente Creek.

The City landfill dewatering trench appears to be a hydraulic barrier to northward migration of the groundwater plume. The dewatering trench is in the shallow zone and the upper portion of the intermediate zone. There is data that suggests it is at least a partial hydraulic barrier in the intermediate zone also.

4.5 Off-Site Areas Land in the off-site areas has been used for residential, agricultural, and commercial purposes since the 1920s. Historically, many activities, including septic tank cleaning, drum storage, vehicle repair, and commercial activities, took place within the area. Commercial activities have included the manufacturing of amusement park equipment, laser devices, printed circuit boards, electrical test equipment, and semiconductors. These land use activities have had adverse impacts on groundwater quality. In addition, septic tank systems have caused bacterial and viral degradation of groundwater so that the water may not be suitable for drinking water purposes without treatment.

Over the past several years, land use within the area has moved away from residential use and toward commercial use. The North Bayshore area is zoned as a planned community zone for commercial and light manufacturing. No new single family dwellings are allowed. Soil and groundwater investigations are being conducted by numerous parties at sites within or adjacent to the area. One of these sites, the CTS Printex, Inc. site, has been listed on the National Priorities List (NPL).

In order for the remedial program contemplated by this Order to be effective, all sources of hazardous substance releases within the area (including sources in aquifers) must be identified and controlled. The Regional Board will utilize its authority under applicable law to require potential sources within the area, for which parties other than Teledyne and Spectra-Physics are responsible, to be investigated and controlled by those parties and to require those parties to coordinate their remedial activities with the activities to be carried out pursuant to this Order. In order to facilitate the effective operation of the remedial systems contemplated by this Order, the Regional Board will provide Teledyne and Spectra-Physics with information concerning sources and remedial activities that may impact such systems.

5. **Soil Investigation**

5.1 Spectra-Physics Since 1984, soil samples have been collected from more than 68 boreholes drilled on-site. Additionally, soil samples have been collected from the sides and bottoms of the pits which remained after the four former sumps were removed, and a soil gas survey was conducted during 1989 in the vicinity of Buildings 2 and 3 in order to assess the lateral extent of soils containing VOCs in the area. These soil investigations have shown that a release of chemicals has occurred at the Spectra-Physics site. The primary volatile organic compounds (VOCs) detected in soil are trichloroethene (TCE) and trans-1,2-dichloroethene

(1,2-DCE). Soil samples collected from adjacent to the sump near Building 3 detected up to 18 parts per million (ppm) TCE and up to 1 ppm toluene. TCE is found in the highest concentrations and over the greatest area. Concentrations of TCE in soils in excess of 2.5 ppm have been detected in soils in the loading dock area, soils in a small area east of Building 2, soils in a small area west of Building 2, and soils below the former Building 3 sump. TCA was detected at 0.4 ppm in a soil sample collected near well S-2 at a depth of 5 feet.

5.2 Teledyne During 1982 through 1983 and 1988 through 1989, soil samples have been collected from 20 boreholes drilled on-site. Soil samples were collected beneath and / or near sumps B/C and D, former tank A and wells T-6S and PZ-5S. These soil investigations indicate that a release of chemicals has occurred at the Teledyne site. TCE was detected at up to 0.27 ppm at soil boring number BPZ5-1. Soil boring BPZ5-1 is located near well PZ-5S. Well PZ-5S is located about 100 feet west of the Teledyne building and 150 feet north of sump D. A soil sample near tank A detected up to 0.258 ppm TCE. While the aforementioned concentrations are the highest soil concentrations detected at Teledyne, based on these detections and the groundwater concentrations found on-site, it is believed that the underground solvent handling activities were sources for groundwater pollution. Due to the relatively low concentrations detected in the soil, soil remediation has not been required.

6. Hydrogeology The two major water-yielding zones beneath the site consist of an upper aquifer and a deep Aquifer. The upper and deeper aquifers are separated by an aquitard of about 80 feet of primarily finer-grained marine clays and fine silts. In the aquitard, discontinuous coarser sediments are infrequently found to approximately 110 feet deep; only fine grained sediments - primarily low permeability clays - have been found below this depth. There are two smaller sub-units within the upper aquifer, called the shallow zone and the intermediate zone. The shallow zone is about 10 feet thick and is comprised of highly permeable sand and gravel and generally occurs between the depths of 10 to about 30 feet. The intermediate zone is about 10 to 15 feet thick and is comprised of sands and gravel and generally occurs between depths of 35 to 70 feet. The intermediate zone has been subdivided into the upper and lower intermediate zone in the vicinity of Spring Street. A separate continuous lower intermediate zone has not been identified in the North Bayshore Area. Ground water in both the shallow and intermediate zones flows generally to the north. The deep aquifer begins at about 150 feet below the land surface and extends to a depth of approximately 700 feet.

6.1 Surface Water Permanente Creek is an intermittent tidal channel along the west side of the on-site and off-site areas. This channel has contained concentrations of VOCs of unknown origin south of the dewatering trench. One Permanente Creek sample collected near Charleston Road detected 19 ppb TCE. One origin for the VOCs may be from the dewatering trench discharge carried south by the tide.

7. Groundwater Investigation

7.1 On-site Investigations Ground water investigations have been ongoing at the Teledyne facility since 1982 and at the Spectra-Physics facility since 1984. Teledyne has installed 21 shallow zone monitoring wells and 10 intermediate zone monitoring wells on its on-site area. Spectra-Physics has installed 17 shallow zone monitoring wells and three intermediate zone monitoring wells on its on-site area. During the March 1990 sampling event, TCE was detected at the Spectra-Physics site up to 1,300 ppb (well S-3). At the Teledyne site during the March and June 1990 sampling event, TCE was detected up to 2,400 ppb (well PZ-5), 1,2-DCE up to 2,400 ppb (well T-6) and vinyl chloride up to 120 ppb (T-6). Other VOCs have been detected including tetrachloroethene (PCE), 1,1-dichloroethane (1,1-DCA) and 1,1-

dichloroethene (1,1-DCE).

In addition, one vertical extent well (VW-1), screened into the aquitard below the intermediate zone, was installed in 1986 in the on-site area. The well is screened at a depth of 91 to 95.5 feet below ground surface and is located along the northern edge of the Teledyne site. Only TCE has been reported in this well, at concentrations ranging from 0.5 parts per billion (ppb) to 9.6 ppb. No VOCs have been reported in VW-1 since June 1988.

7.2 Off-Site Investigations In the off-site area, Teledyne and Spectra-Physics have installed over 100 shallow and intermediate zone monitoring and extraction wells, two deep aquifer monitoring wells, and three vertical extent monitoring wells. The off-site horizontal extent of groundwater pollution in the shallow and intermediate zones has been generally defined to the north at approximately the City of Mountain View dewatering trench, and to the east and west at approximately Armand Avenue and Permanente Creek, respectively. In the off-site area during the June 1990 sampling event, TCE has been detected at concentrations up to 980 ppb (well E1), 930 ppb (well E3), 540 ppb (well E12), and 840 ppb (well ES5S, September 1989). The vertical extent of groundwater pollution extends approximately to the top of the regional aquitard.

8. Potential Conduit Study In 1982, Santa Clara Valley Water District data documented approximately 120 active private domestic wells within a one mile radius of the Teledyne site. Many of these wells were perforated in the upper aquifer. Teledyne, in conjunction with the Santa Clara County Health Department, tested 47 active private wells in the area north of the Bayshore Freeway, between Permanente Creek to the west and Stierlin Road to the east. Sampling results confirmed the presence of TCE and 1,2-DCE in the shallow ground water. Teledyne advanced the costs to connect residents in the area to the municipal water system. Teledyne and Spectra-Physics have submitted potential conduit studies and have recommended sealing certain wells. Wells P-3, 6S2W15D15, and 6S2W15D16 have been sealed.

9. Interim Remedial Actions Three groundwater extraction systems have been installed in the on-site and off-site areas. As part of the remedial program for the on-site area, Teledyne has been extracting groundwater from the shallow zone since October 1986 and from the intermediate zone since March 1988. In addition, Teledyne and Spectra-Physics have installed groundwater extraction systems along Spring Street and in the North Bayshore area. The North Bayshore Extraction System (NBES) consists of eleven shallow zone and six intermediate zone extraction wells. The system began start-up operations on January 4, 1990 and the entire NBES was operating continuously as of March 13, 1990. The Spring Street Extraction System (SSES), consisting of three shallow zone and two intermediate zone extraction wells, has been installed. However, commencement of extraction by this system has been delayed until start up may be coordinated with the start up of the Whisman School District extraction system. The Whisman School District is installing a groundwater extraction system upgradient of the SSES for the remediation of a fuel leak caused by a former underground tank. Extracted groundwater is discharged to the sanitary sewer system.

The 150-acre parcel of the City of Mountain View landfill was excavated below sea level during construction in 1978. The dewatering trench was installed to dewater the excavation until the refuse was filled above sea level. The landfill dewatering trench, which borders the 150-acre landfill parcel located directly north of Amphitheatre Parkway between Permanente Creek and N. Shoreline Blvd., has continued to be operated by the City of Mountain View on a voluntary basis to assist in keeping the groundwater in the North Bayshore area under hydraulic control until the NBES is completed. The NBES was constructed to remediate the off-site groundwater plume once the trench is turned off. The SSES was installed to shorten

the overall remediation time by removing higher concentrations of VOCs.

Finally, Spectra-Physics installed an on-site vapor extraction system which began operation in February 1989.

10. Deep Aquifer Wells There are two active municipal wells within a one mile radius of the Teledyne and Spectra-Physics properties. The two wells are cross-gradient from the sites and have never detected VOCs. There are several former agricultural wells screened in the deeper aquifer in the off-site area. No VOCs have been detected in any wells screened only in the deeper aquifer in the off-site area.

11. Baseline Public Health Evaluation A Baseline Public Health Evaluation (BPHE) was conducted for the site to evaluate current and potential future health risks posed by the site. Current risks are estimated based on exposures that are presently occurring. Potential future health risks are based on exposures that could potentially occur in the future if residential development occurred on the site or if untreated shallow zone groundwater was used for human consumption. To ensure that human health is protected, the BPHE incorporated conservative assumptions. Therefore, it is very unlikely that the actual risks posed by the site would be greater than estimated. Average case and maximum case scenarios are presented in the BPHE. This finding refers to the maximum case scenarios using a 30 year duration exposure. Current exposures include inhalation of TCE volatilized from the sanitary sewer and volatilized from groundwater. The estimated maximum risk to a utility worker from TCE volatilization from the sanitary sewer is 1.1×10^{-6}. The estimated maximum risk from volatilization from groundwater is 1.9×10^{-5}.

Potential future use exposures if no cleanup were to occur could include ingestion of shallow and deeper zone groundwater, inhalation of VOCs from use of shallow or deeper zone groundwater, inhalation of chemicals volatilized from on-site soils and groundwater. The estimated maximum carcinogenic risk from ingestion of shallow groundwater and inhalation of VOCs from the use of shallow groundwater would be 1.06×10^{-2}. The noncarcinogenic hazard index for ingestion of shallow zone groundwater and inhalation of VOCs from the use of shallow groundwater would be 16.56. The carcinogenic risk from inhalation of chemicals volatilized from on-site soil and groundwater would be 1×10^{-6}. The hazard index for inhalation of VOCs volatilized from on-site soils and groundwater would be 9.4×10^{-3}.

Actual future risks may be lower than these estimated potential risk numbers because the assumptions on which these calculations are based may overestimate exposure. For example, these estimated risk calculations assume that the highest chemical concentrations can be found in a single well. For most of the plume area, the chemical concentrations are much lower than the concentrations used to estimate these risks.

Finally, even using the conservative assumptions used in the BPHE, the actual risk from exposure to groundwater will be much lower than the estimated risks because the Companies are currently cleaning up the groundwater.

12. Remedial Investigation/ Feasibility Study / and Final Remedial Action Plan Teledyne and Spectra-Physics have submitted a Remedial Investigation / Feasibility Study (RI/FS) and a Proposed Plan which satisfy the requirements of Regional Board Orders 89-019 and 89-020. This Order presents the final remedy for the Teledyne and Spectra-Physics sites. The final remedy consists of this Order, the RI/FS, the Regional Board Proposed Plan Fact Sheet and the Teledyne and Spectra-Physics Proposed Plan. The RI/FS is made up of the Joint Off-Site RI/FS and the following appendices: Appendix A -- Analytical Modelling of Chemical Concentrations and Time to Reach Remedial Goals in the Study Area; Appendix B -- the

Teledyne Semiconductor On-Site RI/FS; Appendix C -- the Spectra-Physics On-Site RI/FS; and Appendix D -- Estimated Hypothetical Risks associated with Remedial Alternatives. Teledyne and Spectra-Physics prepared a nonbinding preliminary allocation of responsibility (NBAR) and a BPHE which are part of the RI/FS. The technical information contained in the RI/FS and the Proposed Plan Fact Sheet is consistent with the Health and Safety Code requirements for a final Remedial Action Plan (RAP) and the National Contingency Plan requirements for a RI/FS. The final RAP for the sites will be adopted after the Regional Board completes its NBAR determination. The final RAP for the sites will consist of the Order, the RI/FS, the Regional Board Proposed Plan Fact Sheet, the Teledyne and Spectra-Physics Proposed Plan, and the final NBAR determination.

13. Remediation Alternatives In the RI/FS, Teledyne and Spectra-Physics evaluated remediation levels and alternatives separately for the on-site and off-site areas. Teledyne and Spectra-Physics evaluated six alternatives for off-site remediation. Teledyne evaluated five alternatives and Spectra-Physics evaluated six alternatives for remediation on their respective properties. A complete description of these alternatives is contained in the RI/FS.

14. Summary of Evaluation Criteria This section summarizes the nine evaluation criteria developed by EPA and used to compare the alternatives in the RI/FS. The alternatives were evaluated in detail with respect to the nine criteria in the RI/FS report. Each alternative was also evaluated with respect to the six state law criteria set forth in Section 25356.1 of the California Health and Safety Code. A comparative analysis was completed in the RI/FS.

14.1 Overall protection of human health and the environment This criterion addresses whether a remedy provides adequate protection of human health and the environment.

14.2 Compliance with applicable or relevant and appropriate requirements (ARARs) This criterion addresses whether a remedy will meet all of the ARARs or other Federal and State environmental laws.

14.3 Long-term effectiveness and permanence This criterion refers to expected residual risk and residual chemical concentrations after cleanup goals have been met and the ability of a remedy to maintain reliable protection of human health and the environment over time.

14.4 Reduction of toxicity, mobility or volume This criterion refers to the anticipated performance of the treatment technologies a remedy may employ.

14.5 Short-term effectiveness This criterion addresses the period of time needed to achieve cleanup and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

14.6 Implementability This criterion refers to the technical and administrative feasibility of a remedy.

14.7 Cost This criterion includes estimated capital and operation and maintenance, usually presented in a 30 year present worth format.

14.8 Support Agency Acceptance This criterion addresses EPA's acceptance of the selected remedy and any other EPA comments.

14.9 Community Acceptance This criterion summarizes the public's general response to the alternatives.

15. **The Selected Final Remedy**

The selected remedy for the Teledyne on-site area is Alternative No. 2 for the reasons stated in Finding 16. Alternative No. 2 consists of continuing the current groundwater extraction system. Extracted groundwater will either be discharged to the sanitary sewer or treated with air stripping and discharged to the storm drain system or reused. Shallow zone extraction well RA-1 will continue to be pumped at approximately 25 gallons per minute (gpm). Intermediate zone extraction well T-32I will continue to be pumped at approximately 19 gpm. The estimated time to achieve groundwater cleanup is 20 to 90 years. The 30 year present worth cost is $ 1.61 million.

The selected remedy for the Spectra-Physics on-site area is Alternative No. 4 for the reasons stated in Finding 16. Alternative No. 4 consists of expanded soil vapor extraction and treatment and the continued extraction of on-site groundwater by the current groundwater extraction system at the Teledyne facility. The existing soil vapor extraction system of three soil vapor extraction wells at the southeast corner of Building 3 will be expanded to include soil vapor extraction in four additional areas; the northeast and northwest corners of Building 3 and the east and west sides of Building 2. The estimated time to achieve groundwater cleanup is 10 to 70 years. The 30 year present worth cost is $ 2.7 million.

The selected remedy for the off-site area is Alternative 3 for the reasons stated in Finding 16. Alternative 3 consists of continuing the current groundwater extraction with a contingency for additional extraction wells if complete capture is not achieved when the City of Mountain View landfill dewatering system pump is turned off. Disposal of the extracted groundwater will be accomplished by discharge to the sanitary sewer or treatment of the extracted groundwater and discharge to the storm drain system or reuse of the treated groundwater. The current groundwater extraction system consists of 22 groundwater extraction wells; 14 shallow zone and 8 intermediate zone extraction wells. The flow rate of the system is approximately 350 gpm. The estimated time to achieve groundwater cleanup is 30 to 160 years. The 30 year present worth cost is $ 7.4 million.

The total combined groundwater pumping rate of all extraction systems will be approximately 429 gpm or 618,000 gallons per day.

Teledyne and Spectra-Physics will follow Board Resolution 88-160 criteria in determining the best disposal option for the extracted groundwater. Extracted groundwater is currently discharged to the sanitary sewer. This disposal option will be continued unless reuse is determined to be feasible in the required March 31, 1991 reuse report or unless local VOC limits are violated, at which time air stripping treatment may be implemented with disposal to the storm drain.
Groundwater cleanup levels are federal or state MCLs (adopted or proposed) or California Department of Health Services (DHS) Recommended Drinking Water Action Levels (RDWALs). The soil cleanup level is 2.5 ppm total VOCs for the reasons stated in Finding 17.2. The final cleanup levels for the suite of chemicals detected in the shallow zone equate to a future use scenario risk level for groundwater ingestion and inhalation of VOCs of 2.8×10^{-6}. Groundwater disposal will be accomplished by discharge to the sanitary sewer, reuse or air stripping treatment followed by discharge to the storm drain or reuse. Regular groundwater monitoring will be conducted.

The time estimates in this finding are based on modelled results; site-specific conditions, such as adsorption and desorption and other factors described in the RI/FS, will influence the time required to meet the remedial goals through groundwater extraction as well as the ability of the system to achieve the goals.

15.1. Uncertainty in Achieving Cleanup Goals The goal of this remedial action is to restore groundwater to its beneficial uses. Based on information obtained during the RI and on a careful analysis of all remedial alternatives, the Board believes that the selected remedy will achieve this goal. However, studies suggest that groundwater extraction and treatment will not be, in all cases, completely successful in reducing contaminants to health-based levels in the aquifer zones. The Board recognizes that operation of the selected extraction and treatment system may indicate the technical impracticability of reaching health-based groundwater quality standards using this approach. If it becomes apparent, during implementation or operation of the system, that contaminant levels have ceased to decline and are remaining constant at levels higher than the remediation goal or the data otherwise suggest that achievement of the goals is technically impracticable or cannot be achieved within a reasonable time frame, that goal and the remedy may be reevaluated. Reasonable is defined in terms of the cleanup time estimates in the RI/FS.

The selected remedy will include groundwater extraction for a period of years, during which the system's performance will be carefully monitored on a regular basis and adjusted as warranted by the performance data collected during operation. Modifications may include:

a) discontinuing operation of extraction wells in areas where cleanup standards have been attained;

b) alternating pumping at wells to eliminate stagnation points; and

c) pulse pumping to allow aquifer equilibration and encourage adsorbed contaminants to partition into groundwater;

d) installation of additional extraction wells.

15.2 Change to the RI/FS The RI/FS is hereby changed to state that Resolution 68-16 is an Applicable or Relevant and Appropriate Requirement (ARAR).

16. Remedy Selection Rationale and Statutory Determinations All alternatives evaluated in the detailed evaluation consisted of different variations of groundwater extraction except the no-action and institutional controls alternatives. This is because groundwater extraction is essentially the only proven, cost-effective technology for the cleanup of groundwater plumes. The rationale for the selection of the preferred remedies is based mainly on determining how many groundwater extraction wells are necessary to fully capture the groundwater plume and to cleanup the plume in the most efficient time frame and in a cost-effective manner. The selected alternatives meet these objectives.

The selected remedies are protective of human health and the environment. Groundwater contamination is treated so that the remaining potential future risks fall within the 10^{-4} to 10^{-6} carcinogenic risk range for acceptable cleanup levels. The remedies comply with ARARs by achieving cleanup to at least Federal and State MCLs (proposed or adopted) or RDWALs. Soil is remediated to a level that will protect groundwater from future solvent contamination.

The selected remedies are effective in the short-term and are effective in the long-term by virtue of the fact that ARARs are achieved. Soil vapor extraction and treatment and groundwater extraction and treatment are permanent solutions and significantly reduce pollutant toxicity, mobility and volume at the site. All of the alternatives are implementable. The alternatives are cost-effective. EPA has identified the same remedies selected in this order as the preferred alternative in the Proposed Plan fact sheet.

Treatment is used as a principal element for the remedies. Emissions from soil vapor extraction will be treated by vapor phase carbon adsorption with the carbon canisters being regenerated off-site. Treatment of extracted groundwater will be accomplished either by discharge to the sanitary sewer, where local limits will be required to be met, or by air stripping. Emissions from air stripping towers will meet local air district requirements, which are anticipated to be less than a 10^{-6} risk level, or will be required to implement vapor phase carbon treatment.

17. Cleanup Standards

17.1 Groundwater The groundwater cleanup standards for the site are Environmental Protection Agency (EPA) MCLs (proposed or adopted), California Department of Health Services (DHS) MCLs (proposed or adopted), or DHS RDWALs. These cleanup standards are defined in Specification B.4.

17.2 Soil The soil cleanup standards for the Spectra-Physics site is 2.5 ppm total VOCs between depths of 0 to 10 feet and 0.5 ppm between depths of 10 and 14 feet. Spectra-Physics completed a leaching model to determine the amount of VOCs that could be left in soil in order to protect groundwater. The EPA Seasonal Soil Compartmental Model (SESOIL) was used as the soil leaching model. The concentrations leached out of the soil were then input into the AT123D groundwater transport model to determine resultant concentrations in groundwater. Documentation on the modeling is contained in the Spectra-Physics On-Site RI/FS.

18. Risk Associated With Cleanup Standards The selected remedy is protective of human health and the environment -- as required by Section 121 of CERCLA -- in that pollution in groundwater is treated to at least maximum contaminant levels (MCLs) and falls below EPA's acceptable carcinogenic risk range and noncarcinogenic hazard index range. EPA considers a carcinogenic risk range of 10^{-4} to 10^{-6} as an acceptable cleanup level. If the noncarcinogenic hazard index is less than one, EPA considers the combined intake of chemicals unlikely to pose a health risk.

The carcinogenic risk at the cleanup levels associated with the potential future use scenario of groundwater ingestion and inhalation of VOCs from groundwater is 2×10^{-5}. In cleaning up TCE to the 5 ppb cleanup standard and vinyl chloride to the 0.5 ppb cleanup standard, it is quite likely that the concentrations of other VOCs will be reduced to levels below the 5 ppb range. These risks were calculated using a potential future use scenario with a 30 year duration exposure.

The noncancer hazard index associated with the cleanup levels is 0.041. The method and assumptions used to obtain the Carcinogenic Risk and the Hazard Index associated with the cleanup standards are contained in the RI/FS and the BPHE. The cleanup standards for the site are protective of human health, have a carcinogenic risk that falls within a range of 10^{-6} to 10^{-4}, and a hazard index of less than one.

19. Future Changes to Cleanup Standards The Regional Board recognizes that a number of conditions may affect the performance of the North Bayshore, Spring Street, and on-site groundwater extraction systems and the Spectra-Physics soil vapor extraction system. These factors may include: (1) the heterogeneity of the shallow and intermediate zones; (2) the transmissivity of the aquifers; (3) the sustainable yield from the aquifers; (4) the adsorption of chemicals onto, and the rate of desorption from, vadose and aquifer soils and aquitard materials; and (5) the possible existence of sources in off-site areas, the precise location of which cannot be identified. The Regional Board further recognizes that, as a result of these

factors or other factors, achievement of all the remedial standards set forth in this Order may not be practicable. Consequently, this Order calls for periodic evaluation (as stated in the Provisions) of the remedial standards and consideration of adjustment of the remedial standards for portions or all of the site if achievement of such standards is no longer practicable. The periodic evaluation will include the results of the remedy modifications noted in Finding 15.1.

If new information indicates cleanup standards cannot be attained or can be surpassed, the Board and EPA will decide if further final cleanup actions, beyond those completed, shall be implemented at this Site. If changes in health criteria, administrative requirements, site conditions, or remediation efficiency occur, the Teledyne and Spectra-Physics will submit an evaluation of the effects of these changes on cleanup standards as defined in Specification B.4.

The Regional Board recognizes that Teledyne and Spectra-Physics have already performed extensive investigative and remedial work onsite and offsite and that Teledyne and Spectra-Physics are being ordered hereby to perform additional remedial tasks. It is in the public interest to have Teledyne and Spectra-Physics undertake such remedial actions promptly and without prolonged litigation or the expenditure of public funds. The Regional Board recognizes that an important element in encouraging the dischargers to invest substantial resources in undertaking such remedial actions is to provide the dischargers with reasonable assurances that the remedial actions called for in this Order will be the final remedial actions required to be undertaken by the discharger. On the other hand, the Regional Board also recognizes its responsibility to protect water quality, public health, and the environment and that future developments could indicate that some additional remedial actions may be necessary.

The Regional Board has considered and balanced these important considerations, and has determined that the remedial actions ordered herein represent the Regional Board's best, current judgement of the remedial actions to be required of Teledyne and Spectra-Physics. The Regional Board will not require the discharger to undertake additional remedial actions with respect to the matters previously described herein unless: (1) conditions on the site, previously unknown to the Regional Board, are discovered after adoption of this Order, or (2) new information is received by the Regional Board, in whole or in part after the date of this Order, and these previously unknown conditions or this new information indicates that the remedial actions required in this Order may not be protective of public health and the environment. The Regional Board will also consider technical practicality, cost effectiveness, State Board Resolution No. 68-16 and other factors evaluated by the Regional Board in issuing this Order in determining whether such additional remedial actions are appropriate and necessary.

This Order does not contain requirements for cleanup of the area north of the landfill dewatering trench at this time. If VOC concentrations or regulatory requirements change in the future, the Regional Board may order additional remedial actions as described above.

20. Groundwater Conservation Teledyne and Spectra-Physics have considered and continue to consider the feasibility of reclamation, reuse, or discharge to a publicly owned treatment works (POTW) of extracted groundwater, as specified in Board Resolution No. 88-160. Regarding on-site process water reuse and water reclamation, Teledyne and Spectra-Physics are further evaluating the possibilities of on-site water reuse and reclamation. Both properties are mostly paved and use small amounts of irrigation water. In the off-site area, Shoreline Golf Links is one possible candidate for using the groundwater as irrigation water. Groundwater reinjection was evaluated but was determined to have the potential to spread

VOCs, and that fouling or clogging of the injection wells may occur. Permits have been obtained to discharge all of the extracted groundwater to the Palo Alto POTW which constitutes compliance with Board Resolution 88-160.

20.1 Drought Conditions The Regional Board recognizes that drought conditions have existed in Santa Clara Valley for the past several years. Groundwater extraction by Teledyne and Spectra-Physics may exacerbate drought conditions if they persist. With the approval of the Executive Officer, Teledyne and Spectra-Physics may modify or reduce pumping rates for water conservation purposes.

21. Community Involvement An aggressive Community Relations program has been ongoing for all Santa Clara Valley Superfund sites, including the Teledyne and Spectra-Physics sites. The Board published a notice in The View on November 1, 1990, announcing the proposed final RAP and opportunity for public comment at the Regional Board Public Hearing of November 14, 1990 in Oakland, and announcing the opportunity for public comment at an evening public meeting to be held in Mountain View at the Crittendon Middle School on November 14, 1990. A presentation of the final cleanup plan was made at the November 14, 1990 Board Hearing and the November 14, 1990 evening public meeting. The comment period was from November 14, 1990 to December 28, 1990.

Fact Sheets were mailed to interested residents, local government officials, and media representatives. Fact Sheet 1, mailed in August 1989, summarized the pollution problem, the results of investigations to date, and the interim remedial actions. Fact sheet 2, mailed in November 1990, described the cleanup alternatives evaluated, explained the proposed final RAP, announced opportunities for public comment at the Regional Board Hearing of November 14, 1990 in Oakland and the Public Meeting of November 14, 1990 in Mountain View, and described the availability of further information at the Information Repository at the Mountain View Public Library. The Responsiveness Summary summarizes responses to significant comments received during the public comment period.

Fact Sheet 3, to be mailed in January 1991, will explain the final adopted cleanup plan contained in this Order.

22. State Board Resolution 68-16, "Statement of Policy with Respect to Maintaining High Quality Waters in California" On October 28, 1968, the State Water Resources Control Board adopted Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality Waters in California". This policy calls for maintaining the existing high quality of State waters unless it is demonstrated that any change would be consistent with the maximum public benefit and not unreasonably affect beneficial uses. The original discharge of waste to the groundwater at these sites was in violation of this policy; therefore, the groundwater quality needs to be restored to its original quality to the extent reasonable. For the purpose of establishing cleanup objectives, the shallow groundwater at the site is designated a potential source of drinking water. For this reason, the MCLs were accepted as concentrations that meet the intent of Resolution 68-16.

However, the groundwater is not of drinking water quality for reasons other than the presence of VOCs. Because of the presence of high concentrations of sulfate, nitrate, and fecal coliform above federal standards, the groundwater is not suitable as a drinking water source without pretreatment.

The proposed remedial water quality goals meet current applicable health criteria and restore the quality of the groundwater to the extent reasonable given technical and economic constraints. These constraints include the high additional incremental costs for removal of

small amounts of additional chemicals and the need to minimize the removal of groundwater to achieve acceptable remedial goals.

23. Data Validation Development of the Board's final remedy was based on the Board's evaluation of eight years of water and soil quality data. Random samples have been collected and analyzed by the Board to confirm the validity of data generated by the dischargers. Data has been validated using EPA validation guidance. The Board finds that there is sufficient acceptable data to make cleanup decisions.

24. Lead Agency Pursuant to the South Bay Multi-Site Cooperative Agreement and the South Bay Ground Water Contamination Enforcement Agreement, entered into on May 2, 1985 (as subsequently amended) by the Regional Board, EPA and DHS, the Regional Board has been acting as the lead agency. EPA is expected to agree with the selected remedy and issue a Record of Decision following adoption by the Regional Board of the final remedy for the site. The Regional Board will continue to regulate the dischargers' remediation and administer enforcement actions in accordance with CERCLA as amended by SARA, the California Water Code, California Health and Safety Code, and regulations adopted there under.

25. Administrative Record The Administrative Record has been prepared in accordance with EPA Guidance, has been made available for public and PRP review, and provides the backup documentation for the recommendations of staff and decisions by the Board.

26. Nonbinding Preliminary Allocation of Responsibility Teledyne and Spectra-Physics have submitted a draft nonbinding preliminary allocation of responsibility (NBAR) report that identifies potential source areas in the North Bayshore Area and potentially responsible parties. Comments have been received from many of these parties and the parties are collecting site use histories and evaluating whether to proceed with site investigations or remedial measures on those properties. Those investigations and actions will have a bearing on the final NBAR determination. Accordingly, the Regional Board will defer completion of the NBAR until Teledyne Semiconductor and Spectra-Physics have submitted a revised NBAR to the Regional Board. The Regional Board will not adopt a final RAP as defined in the Health and Safety Code for the site until the Board completes its NBAR determination. With the exception of an NBAR determination this order complies with all other requirements for a RAP. The Board expects to make a final NBAR determination within the next six months.

This Order presents the final remedy for the regional program. However, further localized remedial measures may be needed in the offsite area. The Regional Board will use its authority pursuant to Finding 4.5 of this Order to require source control at those sites.

27. This Order is written as a joint Order for Teledyne and Spectra-Physics because the groundwater pollution plumes from both Companies have commingled. Teledyne and Spectra-Physics are encouraged to submit joint reports. If joint reports are not coordinated and submitted, each company is still individually responsible for the joint tasks in this Order.

28. Teledyne Semiconductor, Inc. (hereinafter referred to as a discharger) is a discharger because of the releases of chemicals that have resulted from its waste handling facilities. Spectra-Physics Lasers, Inc. (hereinafter referred to as a discharger) is a discharger because of the releases of chemicals that have resulted from its waste handling facilities.

29. The selected remedy for the Teledyne and Spectra-Physics sites was chosen in accordance with the Health and Safety Code Section 25356.1, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund

Amendments and Reauthorization Act (SARA), the National Oil and Hazardous Substances Pollution Contingency (NCP), California Water Code Section 13304, and pursuant to the Multi-Site Cooperative Agreement. This decision is based on the administrative record for the site.

30. The Board adopted a revised Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) on December 17, 1986. The Basin Plan contains water quality objectives and beneficial uses for South San Francisco Bay and contiguous surface and groundwaters.

31. The existing and potential beneficial uses of the groundwater underlying and adjacent to the facilities include:

    a. Industrial process water supply
    b. Industrial service water supply
    c. Municipal and Domestic water supply
    d. Agricultural water supply

    Upper aquifer groundwater underlying and adjacent to the site is currently not used for any of the above purposes.

    Shallow zone groundwater could potentially migrate into waters that make up marshland in the off-site area.

32. The dischargers have caused or permitted, and threaten to cause or permit waste to be discharged or deposited where it is or probably will be discharged to waters of the State and creates or threatens to create a condition of pollution or nuisance.

33. This action is an order to enforce the laws and regulations administered by the Board. This action is categorically exempt from the provisions of the CEQA pursuant to Section 15321 of the Resources Agency Guidelines.

34. This Order supersedes and rescinds the Teledyne Site Cleanup Order No. 89 - 019, Cleanup and Abatement Order No. 87-002, Cleanup and Abatement Order No. 86-011, and Waste Discharge Requirements Order No. 86-9, and Spectra-Physics Order No. 89 - 020, Cleanup and Abatement Order No. 87-003, Cleanup and Abatement Order No. 86-012 and Waste Discharge Requirements Order No. 86-10.

35. On-site and off-site interim containment and cleanup measures have been implemented to alleviate the immediate threat to the environment posed by the continued migration of the groundwater plume of organic solvents.

36. The Board has notified the dischargers and interested agencies and persons of its intent under California Water Code Section 13304 to prescribe Site Cleanup Requirements for the discharge and has provided them with the opportunity for a public hearing and an opportunity to submit their written views and recommendations.

37. The Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED, pursuant to Section 13304 of the California Water Code and Section 25356.1 of the California Health and Safety Code, that the dischargers shall cleanup and abate the effects described in the above findings as follows:

A. PROHIBITIONS

1. The discharge of wastes or hazardous materials in a manner which will degrade water quality or adversely affect the beneficial uses of the waters of the State is prohibited.

2. Further significant migration of pollutants through subsurface transport to waters of the State is prohibited.

3. Activities associated with the subsurface investigation and cleanup which will cause significant adverse migration of pollutants are prohibited.

B. SPECIFICATIONS

1. The storage, handling, treatment or disposal of soil or groundwater containing pollutants shall not create a nuisance as defined in Section 13050(m) of the California Water Code.

2. The dischargers shall conduct monitoring activities as determined by the Executive Officer to define the current local hydrogeologic conditions, and the lateral and vertical extent of soil and groundwater pollution. Should monitoring results show evidence of plume migration, additional characterization of the pollutant plume may be required.

3. All Teledyne and Spectra-Physics wells shall be used to determine if cleanup standards have been met. This specification shall not preclude the termination of extraction in individual wells in which the cleanup standards have been met.

4. Final cleanup standards for all onsite and off-site wells shall not be greater than the levels as provided in Finding 17. The numerical final cleanup standards, therefore, shall not exceed the below listed levels in any well set forth in the Self-Monitoring Plan:

Chemical		Groundwater Cleanup Standard (ug/l)	Basis
CARCINOGENS	Weight of Evidence		
Vinyl Chloride	A	0.5	1
Trichloroethylene (TCE)	B2	5	1
Tetrachloroethylene (PCE)	B2	5	1
1,1-Dichloroethane (1,1-DCA)	C	5	1
1,1-Dichloroethylene (1,1-DCE)	C	6	1
NONCARCINOGENS			
1,2-dichloroethylene (1,2-DCE)			
cis		6	1
trans		10	1
1,1,1-trichloroethane (1,1,1-TCA)		200	1
Toluene		100*	2
1,2,4-trichlorobenzene (1,2,4-TCB)		40	3

1 - California State Maximum Contaminant Level (MCL) for Drinking Water (proposed or adopted).
2 - California State Recommended Drinking Water Action Level.
3 - Calculated Cleanup Standard.
* - If the State of California proposes or adopts a MCL for toluene, the MCL shall at that time become the cleanup standard for toluene at this Site.

4.1 The soil cleanup standards are 2.5 ppm total VOCs between depths of 0 to 10 feet and 0.5 ppm total VOCs between depths of 10 and 14 feet.

5. The dischargers shall implement the final cleanup plan described in Findings 2 and 15.

6. Final chemical concentrations shall not be found to exceed the appropriate cleanup level based on quarterly analytical results.

7. To show that a southward hydraulic gradient away from the landfill has been achieved and to confirm the effectiveness of the NBES, the dischargers shall compare the groundwater elevations for the following three pairs of wells. The dischargers shall notify the Board if the groundwater elevation in the northerly well of each pair falls below that in the southerly well.

Northerly Well Number	Southerly Well Number	Designated Screened Zone
NC3S	NB23S	Shallow
SMW-15	W-7A	Intermediate
NC4I	NB22I	Intermediate

C. PROVISIONS

1. The dischargers shall submit to the Board acceptable monitoring program reports containing results of work performed according to a the attached self-monitoring program prescribed by the Board's Executive Officer.

2. This Order supersedes and rescinds the Teledyne Site Cleanup Order No. 89 - 019, Cleanup and Abatement Order No. 87-002, Cleanup and Abatement Order No. 86-011, and Waste Discharge Requirements Order No. 86-9, and Spectra-Physics Order No. 89 - 020, Cleanup and Abatement Order No. 87-003, Cleanup and Abatement Order No. 86-012 and Waste Discharge Requirements Order No. 86-10.

3. The dischargers shall comply with this Order immediately upon adoption and the dischargers shall comply with the PROHIBITIONS and SPECIFICATIONS described above, in accordance with the following tasks and compliance time schedules:

COMPLETION DATE/TASK

4. **Teledyne On-Site, Spectra-Physics On-Site, and Joint Off-Site Areas**

a. COMPLETION DATE: March 31, 1991

TASK: GROUNDWATER REUSE AND RECLAMATION: Submit a technical report acceptable to the Executive Officer containing the groundwater reuse and reclamation plan for the treated groundwater. The report shall include documentation of efforts to reuse the water, efforts to secure users for the water, and reasons why potential users would not accept the water and discuss the technical feasibility (including a health risk evaluation) and cost-effectiveness of other water reuse options.

b. COMPLETION DATE: One month after start up of the Spring Street groundwater extraction system

TASK: SPRING STREET EXTRACTION SYSTEM START UP REPORT: Submit a report acceptable to the Executive Officer documenting that the Spring Street Extraction System started up on the same day as the Whisman School District groundwater extraction system, or on a later date agreed to by the School District. The report shall include a letter from the School District agreeing to such later date.

c. EVALUATE CAPTURE AREA OF THE NORTH BAYSHORE EXTRACTION SYSTEM

1) COMPLETION DATE: 90 days after the City of Mountain View stormwater pump is turned off

TASK: EVALUATE CAPTURE AREA OF NORTH BAYSHORE GROUNDWATER EXTRACTION SYSTEM AND PROPOSE ADDITIONAL EXTRACTION WELLS, IF NECESSARY: Submit a technical report acceptable to the Executive Officer containing an evaluation of the capture area of the North Bayshore groundwater extraction

system and a proposal for additional extraction wells, if necessary.

2) COMPLETION DATE: Six months after task c.1).

TASK: START UP OF EXPANDED NBES: Submit a technical report acceptable to the Executive Officer containing the start up report for any proposed expansion of the NBES if the capture area evaluation demonstrates that additional extraction wells are necessary. This report shall contain the final construction schedule for the time period from adoption of this order through submittal of the start up report, as-built construction drawings of the expanded portion of the system, and the first one month of monitoring data.

d. CURTAILING GROUNDWATER EXTRACTION

1) COMPLETION DATE: 90 days prior to proposed curtailment of any groundwater extraction well or treatment system

TASK: WELL PUMPING CURTAILMENT CRITERIA AND PROPOSAL. Submit a technical report acceptable to the Executive Officer containing a proposal for curtailing pumping from any groundwater extraction well(s) and the criteria used to justify such curtailment. This report shall include data to show that groundwater cleanup standards for all VOCs have been achieved and pollutant levels have stabilized or are stabilizing, and that the potential for pollutant levels rising above cleanup standards is minimal. The proposal shall include temporary termination of extraction well operation for an extended period of time to study the effects on chemical migration prior to well abandonment. The report should identify the basis for the time frame to be used to confirm that groundwater concentrations have stabilized at or below final cleanup standards and that the potential for increases above cleanup standards is minimal.

If the dischargers claim that it is not practicable to achieve cleanup standards through continued groundwater extraction in all or any portion of the groundwater plume area, the dischargers shall evaluate the reductions in chemical concentrations, the mass quantities of chemicals being removed through groundwater extraction and the alternative cleanup standards that can be practically achieved. The report shall evaluate alternative means of achieving cleanup standards and whether conditions for waiving an ARAR are met (e.g., that meeting the ARAR is technically impracticable from an engineering perspective) and that the alternative cleanup standard proposed will be protective of human health and the environment.

2) COMPLETION DATE; 60 days after the Board approves curtailment

TASK: IMPLEMENTATION OF CURTAILMENT: Submit a technical report acceptable to the Executive Officer documenting completion of the necessary tasks identified in the technical report submitted for Task d.1).

e. COMPLETION DATE: January 31, 1996

TASK: FIVE-YEAR STATUS REPORT AND EFFECTIVENESS EVALUATION. Submit a technical report acceptable to the Executive Officer containing:

1) the results of any additional investigation;

2) an evaluation of the effectiveness of the installed final cleanup measures and the attainment of soil and groundwater cleanup standards;

3) additional recommended measures to achieve final cleanup standards, if necessary, and the tasks and time schedule necessary to implement any additional final cleanup measures;

4) a comparison of previous expected costs with the costs incurred and projected costs necessary to achieve cleanup standards; and

5) a description of the reuse and reclamation of extracted groundwater.

If the dischargers claim that it is not practicable to achieve cleanup standards through continued groundwater extraction in all or any portion of the groundwater plume area, the dischargers shall evaluate the reductions in chemical concentrations, the mass quantities of chemicals being removed through groundwater extraction and the alternative cleanup standards that can be practically achieved. The report shall evaluate alternative means of achieving cleanup standards and whether conditions for waiving an ARAR are met (e.g., that meeting the ARAR is technically impracticable from an engineering perspective) and that the alternative cleanup standard proposed will be protective of human health and the environment.

f. COMPLETION DATE: 90 days after request made by the Executive Officer

TASK: EVALUATION OF NEW HEALTH CRITERIA. Submit a technical report acceptable to the Executive Officer which contains an evaluation of how the final plan and cleanup standards would be affected, if the concentrations as listed in Specification B.4. change as a result of promulgation of drinking water standards, maximum contaminant levels or action levels or other health based criteria.

g. COMPLETION DATE: 90 days after request made by the Executive Officer

TASK: EVALUATION OF NEW TECHNICAL INFORMATION. Submit a technical report acceptable to the Executive Officer which contains an evaluation of new technical and economic information which indicate that cleanup standards or cleanup technologies in some areas may be considered for revision. Such technical reports shall not be required unless the Executive Officer or the Board determines that such new information indicates a reasonable possibility that the Order may need to be changed under the criteria described in Finding 19.

h. INSTITUTIONAL CONSTRAINTS

1) COMPLETION DATE: March 31, 1991

TASK: PROPOSED CONSTRAINTS. Submit a technical report acceptable to the Executive Officer documenting procedures to be implemented by the discharger, including a deed restriction prohibiting the use of the A zone groundwater as a source of drinking water, and for controlling onsite activities that could endanger the public health or the environment due to exposure to VOCs. Constraints shall remain in effect until groundwater cleanup standards have been achieved and pollutant levels have stabilized in onsite aquifers.

2) COMPLETION DATE: May 31, 1991

TASK: CONSTRAINTS IMPLEMENTED. Submit a technical report acceptable to the Executive Officer documenting that the proposed and approved constraints have been implemented.

i. COMPLETION DATE: April 30, 1991

TASK: REVISED NBAR REPORT. Submit a technical report acceptable to the Executive Officer containing a revised NBAR report. This report shall be sent by certified mail to all PRPs named in the report.

5. **Spectra-Physics On-Site**

a. COMPLETION DATE: November 15, 1991

TASK: START UP OF EXPANDED SOIL VAPOR EXTRACTION SYSTEM: Submit a technical report acceptable to the Executive Officer containing the start up report for the expanded soil vapor extraction system. This report shall contain the final construction schedule for the time period from adoption of this order through submittal of the start up report, as-built construction drawings of the system, and the first two weeks of monitoring data.

b. COMPLETION DATE: March 31, 1992

TASK: EVALUATE EFFECTIVENESS OF SOIL VAPOR EXTRACTION SYSTEM: Submit a technical report acceptable to the Executive Officer which evaluates the effectiveness of the soil vapor extraction system and proposes modifications to the system, if necessary, to accomplish the cleanup standard.

c. COMPLETION DATE: Ninety days after acceptance of the technical report required by task 5.b.

TASK: START UP OF MODIFICATIONS TO SOIL VAPOR EXTRACTION SYSTEM: Submit a technical report acceptable to the Executive Officer documenting completion of any modifications identified in task 5.b.

d. CURTAILING SOIL VAPOR EXTRACTION

1) COMPLETION DATE: 90 days prior to proposed curtailment of any soil vapor extraction well or treatment system

TASK: WELL PUMPING CURTAILMENT CRITERIA AND PROPOSAL. Submit a technical report acceptable to the Executive Officer containing a proposal for curtailing pumping from any soil vapor extraction well(s) or piping and the criteria used to justify such curtailment. This report shall include a proposal indicating the locations of borings and sampling intervals to determine concentrations of VOCs remaining in soil. The proposal may include temporary termination of extraction well operation for an extended period of time to study the effects on chemical migration prior to well abandonment.

If the discharger claims that it is not practicable to achieve cleanup standards through continued soil vapor extraction in all or any portion of the soil plume area and that significant quantities of chemicals are not being removed through soil vapor

extraction, the discharger shall evaluate the reductions in chemical concentrations and the alternative cleanup standards that can be practically achieved. The report shall evaluate alternative means of achieving cleanup standards and whether conditions for waiving an ARAR are met (e.g., that meeting the ARAR is technically impracticable from an engineering perspective) and that the alternative cleanup standard proposed will be protective of human health and the environment.

2) COMPLETION DATE: 60 days after the Board approves onsite curtailment

TASK: IMPLEMENTATION OF CURTAILMENT AND COMPLETION OF ON-SITE SOIL REMEDIATION: Submit a technical report acceptable to the Executive Officer documenting completion of the necessary tasks identified in the technical report submitted for Task d.1). Include the results of chemical analyses of samples from the soil borings.

e. GROUNDWATER EXTRACTION

1) COMPLETION DATE: November 15, 1993

TASK: EVALUATION OF GROUNDWATER EXTRACTION: Submit a report acceptable to the Executive Officer containing an evaluation of the performance of the Spectra-Physics groundwater extraction system and a proposal for additional groundwater extraction wells, if necessary. This evaluation will include an analysis and use of the following factors and/or data:

1) groundwater monitoring well water quality data;
2) RA-1 groundwater extraction system results;
3) soil vapor extraction system data;
4) current scientific and technical literature regarding the operation and effectiveness of groundwater extraction systems.

The evaluation will utilize at least the following factors:

1) The reduction or increase in groundwater monitoring well water quality data. Update the Total VOC Concentrations Table on page 4 of the Responsiveness Summary by adding 1993 data.
2) Compare the average chemical concentrations in the on-site area and the relation of the average chemical concentration to the highest chemical concentrations on-site using 1990 data and 1993 data.
3) Compare the relative plume mass percentage in the on-site area and the relative plume mass percentage in the capture area of RA-1 using 1990 and 1993 data.
4) The capture area of well RA-1.
5) The cost-effectiveness of a groundwater extraction system at Spectra-Physics. The 30 year present worth cost of the installation of a groundwater extraction system at Spectra-Physics shall be included. This shall include the incremental cost increase to Spectra-Physics and shall not include Teledyne costs nor monitoring costs that are incurred regardless of the operation of an on-site Spectra-Physics groundwater extraction system.
6) Other factors that are appropriate due to technical, state-of-the-art or science, or site specific changes.

6. The submittal of technical reports evaluating final remedial measures will include a projection of the cost, effectiveness, benefits, and impact on public health, welfare, and environment of each alternative measure. If any additional remedial investigations and feasibility studies are

found to be necessary, they shall be consistent with the guidance provided by Subpart F of the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300); Section 25356.1 (c) of the California Health and Safety Code; CERCLA guidance documents with reference to Remedial Investigations, Feasibility Studies, and Removal Actions; and the State Water Resources Control Board's Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California".

7. If the dischargers are delayed, interrupted or prevented from meeting one or more of the completion dates specified in this Order, the dischargers shall promptly notify the Executive Officer and the Board may consider revision to this Order.

8. Technical reports on compliance with the Prohibitions, Specifications, and Provisions of this Order shall be submitted quarterly to the Board commencing on April 30, 1991 and covering the previous quarter. On a quarterly basis thereafter, these reports shall (1) summarize work completed since submittal of the previous report, and work projected to be completed by the time of the next report, (2) identify any obstacles which may threaten compliance with the schedule of this Order and what actions are being taken to overcome these obstacles, and (3) include, in the event of non-compliance with Provision C.3. or any other Specification or Provision of this Order, written notification which clarifies the reasons for non-compliance and which proposes specific measures and a schedule to achieve compliance. This written notification shall identify work not completed that was projected for completion, and shall identify the impact of non-compliance on achieving compliance with the remaining requirements of this Order.

   On a quarterly basis, quarterly reports shall include, but need not be limited to, updated water table and piezometric surface maps for all affected water bearing zones, soil and groundwater capture area maps, and appropriately scaled and detailed base maps showing the location of all monitoring wells and extraction wells, and identifying adjacent facilities and structures. When appropriate, due to new data, and upon request by the Executive Officer, new geologic data shall be incorporated in cross-sectional geological maps describing the hydrogeological setting of the site.

9. All hydrogeological plans, specifications, reports, and documents shall be signed by or stamped with the seal of a registered geologist, engineering geologist or professional engineer.

10. All samples shall be analyzed by State certified laboratories or laboratories accepted by the Board using approved EPA methods, where available, for the type of analysis to be performed. All laboratories shall maintain quality assurance/quality control records for Board review.

11. The dischargers shall maintain in good working order, and operate, as efficiently as possible, any facility or control system installed to achieve compliance with the requirements of this Order. The dischargers shall notify the City of Mountain View if the NBES discharge is discontinued for any period of time in excess of 24 hours.

12. Copies of all correspondence, reports, and documents pertaining to compliance with or proposed changes in the Prohibitions, Specifications, and Provisions of this Order, shall be provided to the following agencies:

    a. Santa Clara Valley Water District
    b. Santa Clara County Health Department
    c. U. S. Environmental Protection Agency, Region IX (H-6-3)

d. City of Mountain View

The Executive Officer may additionally require copies of correspondence, reports and documents pertaining to compliance with the Prohibitions, Specifications, and Provisions of this Order to be provided to a local repository for public use.

13. The dischargers shall permit the Board or its authorized representative, in accordance with Section 13267(c) of the California Water Code:

a. Entry upon premises in which any pollution sources exist consistent with the site Health and Safety Plan, or may potentially exist, or in which any required records are kept, which are relevant to this Order.

b. Access to copy any records required to be kept under the terms and conditions of this Order.

c. Inspection of any monitoring equipment or methodology implemented in response to this Order.

d. Sampling of any groundwater or soil which is accessible, or may become accessible, as part of any investigation or remedial action program undertaken by the dischargers.

14. Teledyne shall file a report prior to any changes in site occupancy and ownership associated with its facilities described in this Order. Spectra-Physics shall file a report prior to any changes in site occupancy and ownership associated with its facilities described in this Order.

15. If any hazardous substance, as defined pursuant to Section 25140 of the California Health and Safety Code, is discharged in or on any waters of the state, or discharged and deposited where it is, or probably will be discharged in or on any waters of the state, the discharger shall report such discharge to this Board, at (415) 464-1255 on weekdays during office hours from 8 a.m. to 5 p.m., and to the Office of Emergency Services at (800) 852-7550 during non--business hours. A written report shall be filed with the Regional Board within five (5) working days and shall contain information relative to: the nature of waste or pollutant, quantity involved, duration of incident, cause of spill, Spill Prevention, Control, and Countermeasure Plan (SPCC) in effect, if any, estimated size of affected area, nature of effect, corrective measures that have been taken or planned, and a schedule of these activities, and persons/agencies notified.

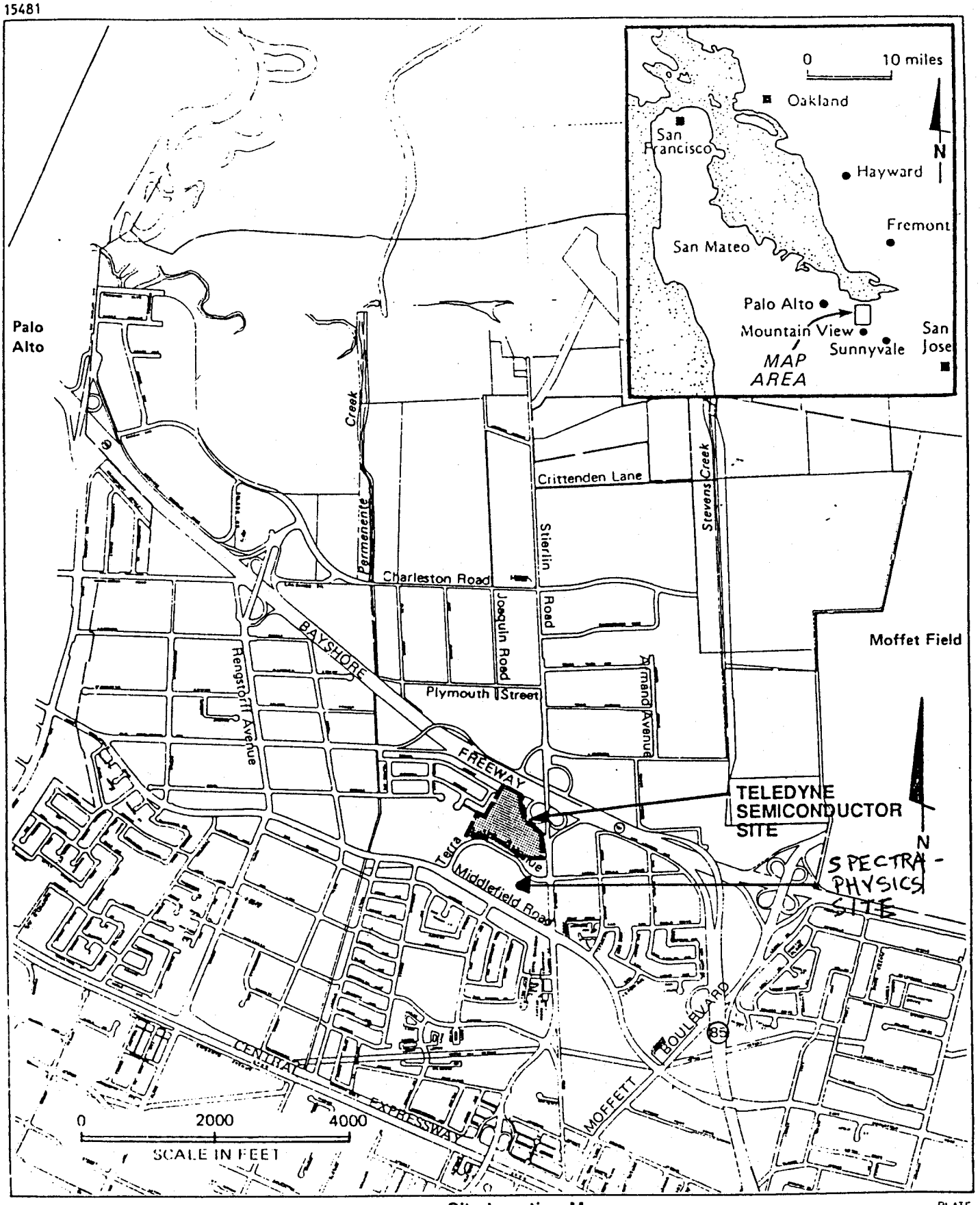
16. The Board will review this Order periodically and may revise the requirements when necessary.

I, Steven R. Ritchie, Executive Officer, do hereby certify that the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on February 20, 1991.

for Steven R. Ritchie
Executive Officer

Attachments:
Self-Monitoring Program
Site Map

15481



Harding Lawson Associates
Engineers Geologists & Geophysicists

Site Location Map
Remedial Investigation/Feasibility Study
Teledyne Semiconductor and Spectra-Physics
Mountain View, California

PLATE **B1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
NJB	17452,141.02	R. Stoufer	10/89		

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

SELF-MONITORING PROGRAM

FOR

Teledyne Components, Inc.
1300 Terra Bella Avenue
Mountain View
Santa Clara County

Spectra-Physics, Inc.
1250 West Middlefield Road
Mountain View
Santa Clara County

ORDER NO. 91-025

CONSISTS OF

PART A, December 1986
As Modified by SBTD, 1/23/87
With Appendices A-E

and

PART B, adopted
February 20, 1991

PART B

Teledyne Components, Inc.
1300 Terra Bella Avenue
Mountain View
Santa Clara County

Spectra-Physics Lasers, Inc.
1250 West Middlefield Road
Mountain View
Santa Clara County

I. DESCRIPTION OF SAMPLING STATIONS

All existing and future shallow, intermediate, and deeper zone monitoring and extraction wells as appropriate. See Table 2 (attached) for list of monitoring wells.

II. MISCELLANEOUS REPORTING.

The discharge of Permanente Creek shall be sampled semi-annually at the Amphitheatre Parkway culvert and analyzed for VOCs using EPA Method 8010.

III. SCHEDULE OF SAMPLING AND ANALYSIS

The schedule of sampling and analysis shall be that given in Table 1 (attached).

IV. MODIFICATIONS TO PART A.

A. Delete Sections B, D, E, F.2, F.3, G.1, G.4.b, G.4.e, and G.4.g.

B. The third sentence in paragraph F.1 shall be changed to read as follows:

Such records shall show the following for <u>each</u> sample, as appropriate:

C. In Section G.2, delete the second paragraph.

D. The first paragraph of Section G.4 shall be changed to read as follows:

Written reports shall be filed with the Regional Board regularly for each calendar quarter (unless otherwise specified) and filed no later than the thirtieth day of the following month. The reports shall be comprised of the following:

E. Section G.4.a.1.) shall be changed to read as follows:

1) Identification of all violations of the site cleanup order and self-monitoring program found during the reporting period.

F. Insert section G.4.a.5) to read as follows:

Time periods during which the soil vapor extraction system or groundwater treatment system was not operating for greater than one day. Time periods during which the individual groundwater extraction wells were not operating for greater than one day.

G. The first paragraph of Section G.4.d. should be changed to read as follows:

Tabulations of the results from each required analysis specified in <u>Part B</u> by date, type of sample and detection limit and station. The report format will be prepared using the examples shown in APPENDIX B.

H. Section G.4.d.4) shall be changed to read as follows:

4) Lab results shall be signed by the laboratory director, copied, and submitted as an appendix to the regular report.

I. Insert Section G.4.d.5) to read as follows:

The EPA Method 8240 analyses shall include tentative identification and semi-quantified concentrations of non-priority pollutant substances of greatest apparent concentration, to be followed by identification and confirmation of peaks of greatest concentration.

J. Insert a new section G.4.g. to read as follows:

For the total soil vapor extraction system and the groundwater extraction system: a quarterly tabulation showing the average air and groundwater flow rate, the average influent air and groundwater concentration and; on an annual basis, estimates of the average chemical mass removal rate from soil and groundwater and the cumulative mass of chemicals removed from soil and groundwater since startup. Include the above tabulations from startup, where available, through the current reporting period. Include concentration and mass data for TCE any other individual main constituents, and total volatile organic compounds.

K. The third sentence of Section G.5 shall be changed to read as follows:

In addition, the report shall contain a comprehensive discussion of the compliance record and all corrective action taken or planned which may be needed to bring the discharger into full compliance with the site cleanup Order and self-monitoring requirements.

I, Steven R. Ritchie, Executive Officer, hereby certify that the foregoing Self-Monitoring Program:

1. Has been developed in accordance with the procedure set forth in this Regional Board's Resolution No. 73-16 in order to obtain data and document compliance with site cleanup requirements established in Regional Board Order No. 91-025.

2. May be reviewed at any time subsequent to the effective date upon written notice from the Executive Officer or request from the discharger, and revisions will be ordered by the Executive Officer or Regional Board.

3. Was adopted by the Board on February 20, 1991.

2/22/91
DATE

Steven R. Ritchie
Executive Officer

Attachments: Table I
Table II

TABLE 1

SCHEDULE FOR SAMPLING, MEASUREMENTS, AND ANALYSIS

SAMPLING --> STATION -->	As listed in Table 2
TYPE OF SAMPLE	G
ANALYSES EPA Method 8010	As listed in Table 2
EPA Method 8240 w/Open Scan	1/Y*

LEGEND FOR TABLE 1

G = grab sample
Q = quarterly, once in March, June, September and December
1/Y = once per year

* EPA 8010 not required for months when EPA 8240 is performed.

TABLE 2

WELL SAMPLING FREQUENCY SUMMARY

Quarterly Wells			Semi-Annual Wells			Annual Wells
E1*	W-1*	T6	S-1	T1	24S	S-4
E2*	W-3	T8*	S-2	T2	24I	S-5
E3*	W-5*	T32I	S-3	T3	25I	S-6
E4*	W-6	RA1	S-8*	T4	26S	S-7
E5*	W-6A	VW1	S-9	T5	26I	S-10
E6*	W-7*		S-11	T7	30S	S-12
E7	W-7A*	NC1S**	S-13	T9	30I	
E8		NC2I**	S-14	T10		T33I
E9	SP-10I*	NC3S**	S-15I	T11*	W2	
E10*		NC4I**	S-16I	T12	W2A	6S2W09Q1
E11*	21	NC5S**	S-17	T13	W4	6S2W16G7
E12*	22	NC6I**	S-18	T14	W4A	6S2W10E02
E13	23		S-18A	T15		
E14*	27I	MS1S	S-19	T19	VW2	
E15*	28S	MS2I		T20	VW3	
E16*	28I	MS3I		T31S	VW4	
E17*	29S	MS4S	R-1	T34S		
	29I	MS5I	R-2	PZ1		
		MS6I		PZ2		
	C1	MS7I		PZ3		
	C2	MS8I		PZ4		
		MS9S		PZ5		
				PZ6		
		ES1S		PZI1		
		ES2S				
		ES3I				
		ES4I				
		ES5S				

NOTE: All wells sampled are to be analyzed by EPA Method 8010 unless otherwise noted

+ Approximate Sampling Date

* To be analyzed once a year for EPA Method 8240

** To be analyzed each quarter by EPA Method 8240